Salmonellosis (Non-Typhoid)

Note: This chapter focuses on salmonellosis that is not typhoid. For information about typhoid fever (or salmonellosis caused by *Salmonella typhi*) refer to the chapter entitled "Typhoid Fever."

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Salmonellosis refers to disease caused by any serotype of bacteria in the genus *Salmonella* other than *Salmonella typhi* (the *Salmonella* species which causes typhoid fever).

The way *Salmonella* bacteria are named has undergone considerable evolution in recent years. A new classification for *Salmonella* has been proposed based on DNA relatedness. This new nomenclature recognizes only two species: *Salmonella bongori* and *Salmonella enterica*, with all human pathogens being regarded as serovars within the subspecies of *S. enterica*. For example, the proposed nomenclature would change *S. typhi* to *S. enterica* serovar Typhi, abbreviated *S.* Typhi and *Salmonella enterica* serovar Enteritidis would be referred to as *S.* Enteritidis instead of *S. enteritidis*.

B. Clinical Description

The most common symptoms of salmonellosis are diarrhea (sometimes bloody), stomach cramps, fever, nausea, and sometimes vomiting. Dehydration may be severe, especially among infants and the elderly, and invasive disease may occur. The infection may also present as septicemia, an abscess, arthritis or cholecystitis.

C. Reservoirs

Salmonella bacteria are widely distributed in the animal kingdom, including livestock, pets, poultry and other birds, reptiles and amphibians. Most infected animals are chronic carriers. Humans can also be sources of infection.

D. Modes of Transmission

Salmonella is transmitted via the fecal-oral route. The most common mode of transmission is ingestion of food or water that has been contaminated with human or animal feces. This includes raw or undercooked poultry, eggs and egg products; undercooked meats; and raw milk or milk products. However, any food contaminated with the bacteria can be a source of infection. For example, outbreaks have been traced to the consumption of raw fruits and vegetables contaminated during slicing. In addition, reptiles such as iguanas and lizards are chronic carriers of these bacteria and can be sources of infection. Person-to-person spread can also occur, especially among household contacts, preschool children in daycare, and the elderly and developmentally disabled living in residential facilities. Transmission can also occur person-to-person through certain types of sexual contact (*e.g.*, oral-anal contact). A large dose of organisms is usually needed to cause infection, but the infectious dose may be lower for certain susceptible groups such as children, the elderly and the immunocompromised.

E. Incubation Period

The incubation period can vary from 6 to 72 hours but is usually about 12–36 hours, although incubation periods longer than 3 days have been documented.

F. Period of Communicability or Infectious Period

The disease is communicable for as long as the infected person excretes *Salmonella* bacteria in their stool. This can last from days to months, depending on the serotype, but rarely lasts more than one year. Treatment with antibiotics can prolong carriage.

G. Epidemiology

Salmonellosis has a worldwide distribution, with approximately 5 million cases occurring annually in the United States alone. About 60–80% of cases are sporadic, but large outbreaks have occurred in institutional settings and nationwide from common food sources. The largest common-vehicle outbreak of salmonellosis ever recognized in the United States was caused by ice cream made by a large national producer from premix that had been transported in contaminated tanker trucks. In Massachusetts, *S. enteritidis* and *S. typhimurium* account for over 50% of *Salmonella* serotypes isolated.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. What to Report to the Massachusetts Department of Public Health

- Isolation of *Salmonella* species from any clinical specimen.

Note: For *Salmonella typhi*, see the chapter entitled "Typhoid Fever." See Section 3C below for information on how to report a case.

B. Laboratory Testing Services Available

The Massachusetts State Laboratory Institute (SLI), Enterics Laboratory will test stool specimens for the presence of *Salmonella* and will also confirm and serotype isolates of *Salmonella* obtained from clinical specimens at other laboratories. Additionally, the Enteric Laboratory requests that all laboratories submit *all* isolates cultured for typing to aid in public health surveillance. For more information contact the Enterics Laboratory at (617) 983-6610.

The SLI, Food Microbiology Laboratory (617- 983-6616) will test implicated food items from a cluster or outbreak. See Section 4) D, Environmental Measures, for more information.

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify whether the case may be a source of infection for other persons (*e.g.*, a diapered child, daycare attendee or foodhandler) and, if so, to prevent further transmission.
- To identify transmission sources of public health concern (*e.g.*, a restaurant or a commercially distributed food product) and to stop transmission from such sources.

B. Laboratory and Healthcare Provider Reporting Requirements

Refer to the lists of reportable diseases (at the end of this manual's Introduction) for information.

C. Local Board of Health Reporting and Follow-Up Responsibilities

1. **Reporting Requirements**

Massachusetts Department of Public Health (MDPH) regulations (*105 CMR 300.000*) stipulate that each local board of health (LBOH) must report the occurrence of any case of salmonellosis, as defined by the reporting criteria in Section 2) A above. Current requirements are that cases be reported to the MDPH Division of Epidemiology and Immunization, Surveillance Program using an official MDPH *Bacterial and Parasitic Gastroenteritis Case Report Form* (Appendix A). Refer to the *Local Board of Health Reporting Timeline* (at the end of this manual's introductory section) for information on prioritization and timeliness requirements of reporting and case investigation.

2. **Case Investigation**

   a. It is the LBOH responsibility to complete a *Bacterial and Parasitic Gastroenteritis Case Report Form* (in Appendix A) by interviewing the case and others who may be able to provide pertinent information. Much of the information on the form can be obtained from the case's healthcare provider or the medical record.

b. Use the following guidelines to assist you in completing the form:
   1) Accurately record the demographic information, date of symptom onset, symptoms, and medical information.
   2) When asking about exposure history (food, travel, activities, etc.), use the incubation period range for salmonellosis (6–72 hours). Specifically, focus on the period beginning a minimum of 6 hours prior to the case's onset date back to no more than 72 hours before onset.
   3) If possible, record any restaurants at which the case ate, including food item(s) and date consumed. If you suspect that the case became infected through food, use of the MDPH *Foodborne Illness Complaint Worksheet* (in Appendix A) will facilitate recording additional information. It is requested that LBOHs fax or mail this worksheet to the MDPH Division of Food and Drugs (see top of worksheet for fax number and address). This information is entered into a database to help link other complaints from neighboring towns, thus helping to identify foodborne illness outbreaks. *This worksheet does not replace the Bacterial and Parasitic Gastroenteritis Case Report Form.*
   4) Ask questions about travel history and outdoor activities to help identify where the case became infected.
   5) Ask questions about water supply because salmonellosis may be acquired through water consumption.
   6) Household/close contact, pet or other animal contact, daycare, and food handler questions are designed to examine the case's risk of having acquired the illness from, or potential for transmitting it to, these contacts. Ask specifically about exposure to reptiles. Determine whether the case attends or works at a daycare facility and/or is a foodhandler.
   7) If you have made several attempts to obtain case information, but have been unsuccessful (*e.g.,* the case or healthcare provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason why it could not be filled out completely.

c. After completing the case report form, attach lab report(s) and mail (in an envelope marked "Confidential") to the MDPH Division of Epidemiology and Immunization, Surveillance Program. The mailing address is:

   MDPH, Division of Epidemiology and Immunization
   Surveillance Program, Room 241
   305 South Street
   Jamaica Plain, MA 02130

d. Institution of disease control measures is an integral part of case investigation. It is the LBOH responsibility to understand, and, if necessary, institute the control guidelines listed below in Section 4), Controlling Further Spread.

4) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (*105 CMR 300.200*).

Foodhandlers with salmonellosis must be excluded from work. *Note:* A case of salmonellosis is defined by the reporting criteria in Section 2) A of this chapter.

Minimum Period of Isolation of Patient

After diarrhea has resolved, foodhandlers may only return to work after producing one negative stool specimen. If the case has been treated with an antimicrobial, the stool specimen shall not be submitted until at least 48 hours after cessation of therapy. In outbreak circumstances, a second consecutive negative stool specimen will be required prior to returning to work.

Minimum Period of Quarantine of Contacts

Contacts with diarrhea who are foodhandlers shall be considered the same as a case and handled in the same fashion. No restrictions otherwise.

Note: A foodhandler is any person directly preparing or handling food. This can include a patient care or child care provider. See glossary for a more complete definition.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

Daycare

Since salmonellosis may be transmitted person-to-person through fecal-oral transmission, it is important to carefully follow up on cases of salmonellosis in a daycare setting. The MDPH *Health and Safety in Child Care* provides detailed information on case follow-up and control in a daycare setting. General recommendations include:

- Children with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is gone.

- Children with *Salmonella* infection who have no diarrhea and are not otherwise ill may be excluded or may remain in the program if special precautions are taken.

- Since most staff in child care programs are considered foodhandlers, those with *Salmonella* in their stools (symptomatic or not) can remain on site, but must not prepare food or feed children until their diarrhea is gone and they have one negative stool test (submitted at least 48 hours after completion of antibiotic therapy, if antibiotics are given). (Per *105 CMR 300.200*)

- Refer to Chapter 17 of the MDPH *Health and Safety in Child Care* for complete guidelines on handling diseases spread through the intestinal tract.

School

Since salmonellosis may be transmitted person-to-person through fecal-oral transmission, it is important to follow up on cases of salmonellosis in a school setting carefully. The MDPH *Comprehensive School Health Manual* provides detailed information on case follow-up and control in a school setting. General recommendations include:

- Students or staff with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is gone.

- Students or staff with *Salmonella* who do not handle food, have no diarrhea or mild diarrhea, and are not otherwise sick may remain in school if special precautions are taken.

- Students or staff who handle food and have a *Salmonella* infection (symptomatic or not) must not prepare food until their diarrhea is gone and they have one negative stool test (submitted at least 48 hours after completion of antibiotic therapy, if antibiotics are given). (Per *105 CMR 300.200*)

- Refer to Chapter 8 of the MDPH *Comprehensive School Health Manual* for complete guidelines on handling diseases spread through the intestinal tract.

Community Residential Programs

Actions taken in response to a case of salmonellosis in a community residential program will depend on the type of program and the level of functioning of the residents.

In long-term care facilities, residents with salmonellosis should be placed on standard (including enteric) precautions until their symptoms subside *and* they test negative for *Salmonella*. (Refer to the Division of Epidemiology and Immunization's *Control Guidelines for Long-Term Care Facilities* for further actions. A copy can be obtained by calling the Division at 617-983-6800.) Staff members who give direct patient care

(*e.g.*, feed patients, give mouth or denture care, or give medications) are considered foodhandlers and are subject to foodhandler restrictions under *105 CMR 300.200*. See Section 4) A above. In addition, staff members with *Salmonella* infection who are not foodhandlers should not work until their diarrhea is gone.

In residential facilities for the developmentally disabled, staff and clients with salmonellosis must refrain from handling or preparing food for other residents until their diarrhea has subsided and they have one negative stool test for *Salmonella* (submitted at least 48 hours after completion of antibiotic therapy, if antibiotics are given). (Per *105 CMR 300.200*.) In addition, staff members with *Salmonella* infection who are not foodhandlers should not work until their diarrhea is gone.

Reported Incidence Is Higher than Usual/Outbreak Suspected
If the number of reported cases of *Salmonella* in your city/town is higher than usual, or if you suspect an outbreak, investigate to determine the source of infection and mode of transmission. A common vehicle (such as water, food or association with a daycare center) should be sought and applicable preventive or control measures should be instituted. Control of person-to-person transmission requires special emphasis on personal cleanliness and sanitary disposal of feces. Consult with the epidemiologist on-call at the Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several town lines and therefore be difficult to identify at a local level.

Note: Refer to the MDPH *Foodborne Illness Investigation and Control Reference Manual* for comprehensive information on investigating foodborne illness complaints and outbreaks. (Copies of this manual were distributed to local boards of health in 1997–98. It can also be located on the MDPH website in PDF format at <http://www.magnet.state.ma.us/dph/fpp/refman.htm>.) For recent changes (fall of 2000) to the Massachusetts Food Code, contact the Division of Food and Drugs, Food Protection Program at (617) 983-6712 or through the MDPH website at <http://www.state.ma.us/dph/fpp/>.

D. Preventive Measures

Environmental Measures
Implicated food items must be removed from the environment. A decision about testing implicated food items can be made in consultation with the Division of Food and Drugs (DFD) or the Division of Epidemiology and Immunization. DFD can help coordinate pickup and testing of food samples. If a commercial product is suspected, DFD will coordinate follow-up with relevant outside agencies. DFD is reachable at (617) 983-6712.

Note: The role of the DFD is to provide policy and technical assistance with the environmental investigation such as interpreting the Massachusetts Food Code, conducting a HACCP risk assessment, initiating enforcement actions and collecting food samples.

The general policy of the SLI is only to test food samples implicated in suspected outbreaks, not in single cases (except when botulism is suspected). The LBOH may suggest that the holders of food implicated in single case incidents locate a private laboratory that will test food or store the food in their freezer for a period of time in case additional reports are received. However, a single, confirmed case with leftover food consumed within the incubation period may be considered for testing.

Note: Refer to the MDPH's *Foodborne Illness Investigation and Control Reference Manual* for comprehensive information on investigating foodborne illness complaints and outbreaks.

Personal Preventive Measures/Education
To avoid future exposures, recommend that individuals:

- Always wash their hands thoroughly with soap and water before eating or preparing food, after using the toilet, after changing diapers, and after touching their pets or other animals (especially reptiles).
- After changing diapers, wash the child's hands as well as their own.
- In a daycare setting, dispose of feces in a sanitary manner.

- Keep food that will be eaten raw, such as vegetables, from becoming contaminated by animal-derived food products.
- Avoid letting infants or young children touch reptiles, such as turtles or iguanas, or their cages.
- If elderly or immunocompromised, avoid reptiles when choosing pets.
- In a daycare or school, do not use reptiles as classroom pets.
- Make sure to thoroughly cook all food products from animals, especially poultry and eggs, and avoid consuming raw or cracked eggs, unpasteurized milk, or other unpasteurized dairy products.
- Avoid sexual practices that may permit fecal-oral transmission. Latex barrier protection should be emphasized as a way to prevent the spread of salmonellosis to sexual partners as well as being a way to prevent the exposure to and transmission of other pathogens.

Salmonella and *Salmonellosis from Reptiles Public Health Fact Sheets* can be obtained from the Division of Epidemiology and Immunization or through the MDPH website at <http://www.state.ma.us/dph/>. Click on the "Publications" link and scroll down to the Fact Sheets section. The *Salmonella Public Health Fact Sheet* is also available in Spanish.

ADDITIONAL INFORMATION

The formal Centers for Disease Control and Prevention (CDC) surveillance case definition for salmonellosis is the same as the criteria outlined in Section 2) A of this chapter. (CDC case definitions are used by the state health department and CDC to maintain uniform standards for national reporting.) For reporting to the MDPH, always refer to the criteria in Section 2) A.

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